

A spring contact pin for making contact with electrical or electronic test items to be tested, having a sleeve in which a contact element can slide against the force of at least two, coaxial helical compression springs which are produced with the same winding direction or the opposite winding direction and are of the same length or of different lengths, as a result of which higher contact forces and/or a longer life can be achieved than in the case of spring contact pins having a single helical compression spring. At least two helical compression springs have turns of different diameter.

The invention refers to a spring loaded contact pin in accordance with the generic term of the requirement 1. Inspection fixtures of this kind are admitting and exhibit generally a test adapter or a such with a multiplicity of contacting printed circuit boards which can be examined or other test specimens serving spring loaded contact pins, s. e.g. Krueger "inspection device for the examination of printed circuit boards for clocks", yearbook of the German society for Chronometrie, Bd. 30, 1979, S. 269-276.

Admitted spring loaded contact pins of this kind (DE-OS 28 52 886; Krueger as above) exhibit a case, into which a cylindrical screwing jerk feather/spring is inserted, which pushes a piston away of the contact element slidable arranged in the case spring-tensioned and at the soil of the case. This contact element exhibits a shank arranged at the piston coaxially to it, at which a contact head is firmly arranged, which is intended for contacting the test specimens. Such spring loaded contact pins must apply relatively high spring action despite the very small outside diameters of their cases from usually at the most 1.5 mm, usually spring action, i.e. contacting force, with which the contact element of the spring loaded contact pin is pressed in slightly to test specimens, from usually at least 50 N, preferably usually 80 to 500 N. DIESE high spring action lowers the life span of the feather/spring of the spring loaded contact pin, since the feathers/springs are loaded despite their small diameters with according to high thrusts, or one must use her for the extension of the life span, i.e. the number of the load changes up to the break of the screwing jerk feather/spring, only for smaller contacting force than actually possible, which however the danger of to small contacting force, no safe electrical contact with the test specimens to more ensure, causes.

It is therefore a task of the invention to create a spring loaded contact pin in the generic term of the requirement 1 kind specified with which on economical, structurally simple way particularly high life span and/or particularly high contacting force can be achieved.

This task is solved according to invention by the characteristics specified in the characteristic of the requirement 1.

This spring loaded contact pin lets particularly high life span and particularly high contacting force reach in structurally simple, economical way. Preferably the screwing jerk feathers/springs can be so arranged that the spring action exercised by them on the contact element add themselves, i.e. that they are "parallel switched" strength-moderately.

If furthermore, as preferentially intended, only ever a only one outside and internal screwing jerk feather/spring are present, then this pair of feathers/springs joined in parallel is more strongly compactible, as if two outside screwing jerk feathers/springs of same turn diameter are into one another-set intended.

When loading screwing jerk feathers/springs shear stresses in these develop. The more largely these shear stresses are the shorter, are among other things the life span of a such feather/spring. By distribution of the shear stress on several screwing jerk feathers/springs the maximum shear stress in the individual feather/spring becomes smaller, if equal contacting force remains or it becomes the contacting force more largely, if the maximum shear stress remains equal each feather/spring. Between the two extreme values the relationship shear stress/contacting force can vary, if in place of a screwing jerk feather/spring used werden. Indem at least an internal screwing jerk feather/spring is inserted two or more screwing jerk feathers/springs into at least an outside screwing jerk feather/spring, the area within the outside feather/spring for the volume-constant or partial accommodation of the internal feather/spring is used and thus the shear stress better distributed. Thereby the life span of the screwing jerk feathers/springs and/or the contacting force exercisable by it are increased among other things. Two coaxially arranged screwing jerk feathers/springs with different turn diameters result further, i.e. uses with different middle turn diameters, by which the one, bspw. the inside, is inserted with certain pre-loading between case soil and piston, while the other one exhibits a smaller length than the distance from the case soil to the piston, then the spring loaded contact pin when contacting the test specimen first with smaller (as a function of the piston stroke) rising contacting force and afterwards with large rising contacting force against the test specimen is pressed, which for certain uses of advantage is. Such a spring loaded contact pin has then a broken feather/spring characteristic, since first only one screwing jerk feather/spring works and those comes at least another screwing jerk feather/spring only during the piston movement to the effect.

At the beginning of and final strength as well as the process altogether of the spring action of the spring loaded contact pin over the piston stroke, exercisable of the feathers/springs, can be specified within a wide range.

Continuous approximately straight feather/spring characteristics or feather/spring characteristics also broken can be achieved problem-free. Also the same kind can be used by spring loaded contact pins for the examination of very different test specimens.

In accordance with a further training of the invention at least ever a "inside" and "expresses" screwing jerk feather/spring with different direction manufactured, whereby it is prevented that they can hook themselves into one another.

A special advantage with the spring loaded contact pin according to invention is given also by the fact that with the break of a screwing jerk feather/spring the spring loaded contact pin does not become useless, since in this case as it were as notlaufeigenschaft, which or fits other screwing

jerk feather/spring with springs is present and/or is, their contacting force, even if this is smaller, can be still, used further.

Two remark examples of the invention are described in the following on the basis a design.

In the design shows Fig. 1 a profile by a spring loaded contact pin with two feathers/springs of same length, same directiondirection direction and with different turn diameters,

Fig. 2 a profile by a spring loaded contact pin with three feathers/springs of different directiondirection direction and with different turn diameters.

Fig. 1 shows a profile by a spring loaded contact pin 1. This exhibits a case 2, attached to their soil 3 a wring lead 4, bspw. soldered on or welded is, which is resumed to a not represented electrical evaluation mechanism, which evaluates the test signals on accuracy of the test specimen, led by means of the spring loaded contact pins, with the examination of a test specimen.

The case 2 is restricted at their above-lateral opening 5 Innenringschulter 21 umgeboerdelte by one bspw.. In the case 2 an axially freely mobile piston 6 is substantial, preferably einstueckigen, rigid or rigid contact element 7 - which one can call also contact pins - arranged, who exhibits a shank 8 rising up outward by the opening 5, at whose end a metallic contact head 9 is arranged, which serves a metallic conductive strip 10 of an electrical printed circuit board 11 for contacting the respective test specimen, here.

The contact head 9 can be if necessary also a separate part, which is connected by welding with the shank 8 solvable or inseparably, bspw.

The piston 6 exhibits a circle-cylindrical range 20 led in the case 2 with sliding bearing play, to which a kegelstumpffoermige Ringschulter attaches 21 min, which rests in the represented front resting position of the piston 6 against the Innenringschulter 21 serving for it as notice. The contact element 7 can be a einstueckiges metal part.

Between the soil 3 of the case 2 and the piston 6 of the contact element 7 two screwing jerk feathers/springs 12 and 13 with pre-loading are arranged, which rest against the piston 6 and against the open end of 5 of the case 2 press so the contact element 7. The two feathers/springs 12, 13 are represented with same directiondirection direction and with exaggerated feather/spring wire sizes from each other deviating, whereby the outside screwing jerk feather/spring 12 exhibits as large a turn diameter as possible, which is determined by the cylindrical inner wall of the case 2 and whereby the internal screwing jerk feather/spring 13 exhibits such a smaller turn diameter that it is coaxially to the other feather/spring arranged, preferably completely within this outside feather/spring 12 arranged, without these affects too muessen. Zu this purpose is thus the inside diameter, i.e. their turn inside diameter of the outside feather/spring 12 more largely than the outside diameter, i.e. the turn outside diameter of the internal feather/spring 13.

The einbaulaengen of both feathers/springs 12, 13 are here equivalent large, i.e. the lengths, which have them in inserted condition in the resting position of the contact element 7, if this rests against the notice 21.

When lowering the printed circuit board 11 the contact head 9 hits on the conductive strip 10 of the printed circuit board 11 which can be examined, as in Fig. 1 represented. When far lowering the piston 6 is moved toward to the soil 3 of the case 2. Thus both screwing jerk feathers/springs 12 and 13 are squeezed together and consequently increased the contacting force between the contact head 9 and the conductive strip. By the distribution of the arising contacting force and the two screwing jerk feathers/springs 12 and 13 the load of each of the two feathers/springs becomes smaller and consequently the life span of the spring loaded contact pin 1 larger, than it would be with only one screwing jerk feather/spring with the same contacting force the case.

As furthermore represented, the number of Windungen/cm of the internal feather/spring 13 is substantially larger than the number of Windungen/cm of the outside feather/spring 12, which prevents that the two feathers/springs 12, 13 resemble directiondirection direction here despite that hook itself among themselves can.

In Fig. 2 a profile is likewise represented to that by a spring loaded contact pin 1, itself of the remark example in Fig. 1 only by the number and the dimensions of the screwing jerk feathers/springs 14-16 differentiates. The elements with the reference symbols 1 to 11 are with those in Fig. 1 identically and exercise the same function. A repeated description of these elements is therefore unnecessary.

Between the soil of the piston 6 and the soil 3 of the case 2 three to each other coaxially arranged screwing jerk feathers/springs 14, 15, 16 are present with this remark example. This soil of the piston 6 and the soil 3 of the case 2 form the counter bearings, at which the feathers/springs can push away and/or support 14 to of 16 for the practice their thrust forces. The internal feather/spring 14 is like the feather/spring 13 in Fig. 1 with pre-loading between piston 6 and soil 3 stored and exhibits like these a smaller turn diameter than the two different, it with radial distance comprehensive outside screwing jerk feathers/springs 15 and 16, those both same, as large a turn diameter as possible (like the feather/spring 12 in Fig. 1) exhibit and as represented, into one another-set arranged are.

Both screwing jerk feathers/springs 15 and 16 are however, differently than feather/spring 14, without pre-loading inserted, so that their lengths - which are identical in this remark example, can be also unequal however - with at the notice formed by the Innenringschulter 21 of the case 2 lying close piston 6 are smaller than, the represented distance (quiescent distance) of the piston available thereby 6 from the soil 3. The two feathers/springs 15 and 16 have thus shorter einbaulaengen than the internal feather/spring 14 and are into one another according to kind of a two-usual screw thread arranged and to have the same directiondirection direction, whereas the screwing jerk feather/spring 14 exhibits the directiondirection direction opposite in addition. The screwing jerk

feathers/springs point depending upon material, wire size, turn diameter and upward gradient different spring action upist bspw. the screwing jerk feather/spring 14 "yield" to feather/spring and are the two screwing jerk feathers/springs 15 and 16 "hard" feathers/springs, then the spring loaded contact pin 1 presses when lowering the printed circuit board 11 first only with the small spring action "yields" screwing jerk feather/spring 14 on the test specimen, until the screwing jerk feathers/springs push 15 and 16 away reciprocally, whereby when far lowering the printed circuit board 11 the contacting force increases more steeply, since now all three feathers/springs are effective and add themselves their spring action.

Due to the opposite directions (turn directions) of the screwing jerk feather/spring 14 to same directions the exhibiting feathers/springs 15, 16 the feather/spring 14 with the feathers/springs 15, 16 cannot hook itself.

It is possible, federdraechte with other one than circular cross section to use bspw. with square or rectangular cross section.

The screwing jerk feathers/springs 12 to 16 are cylindrical coil springs, which is particularly favorable. If it is desired for reasons of special feather/spring characteristics, also at least one feather/spring can be a not-cylindrical screwing jerk feather/spring, preferably a conical spring.

The spring loaded contact pin after Fig. 2 it can be modified also in such a way that at least one of the feathers/springs is so long 15 or 16 that it constantly stands under pre-loading, against what the other outside feather/spring and/or the internal feather/spring 14 than the quiescent distance of the piston 6 by the soil 3 can be preferably shorter and/or to be able and thereby differently broken feather/spring characteristic of this spring loaded contact pin 1 develops, or that it exhibits only the pairs of feathers/springs 14, 15 or 16. If furthermore with the remark example after Fig. 2 the feathers/springs 15, 16 is differently long, however than the quiescent distance of the piston 6 of the soil 3 is further shorter, then results a feather/spring characteristic of the spring loaded contact pin twice broken, which likewise is of advantage in many cases, as then all three feathers/springs have 14 to 16 different einbaulaengen.

By variation of the characteristics mentioned it is easily and way possible to manufacture spring loaded contact pins with the most different feather/spring characteristics which exhibit both higher life span or higher contacting force or both together opposite well-known spring loaded contact pins and make also further advantages possible beyond that.

In both remark examples the feathers/springs are 12, 13 and/or 14-16 as represented so arranged that they push all away at the soil 3 of the case 2, so that the spring action exercised by them in each case on the contact element 7 add themselves. Thereby it comes in the case of the Fig. 2 also to the broken feather/spring characteristic of this spring loaded contact pin. A broken feather/spring characteristic can be however also reached bspw. by it that two screwing jerk feathers/springs of same turn diameter, however differently steep feather/spring characteristics are arranged in row, by which the softer still during the way of the contact element is completely

squeezed together.

Instead of planning a only one internal screwing jerk feather/spring, it is also possible in some cases to plan at least two internal screwing jerk feathers/springs - preferably similarly as the feathers/springs 15, 16 also equal large turn diameters in kind of a two-usual screw thread into one another-set - which are embraced inserted into the interior at least an outside screwing jerk feather/spring and like that by this at least outside screwing jerk feather/spring.

1. Spring loaded contact pin for contacting electrical or electronic test specimens, like printed circuit boards or such, which can be examined, which spring loaded contact pin is intended electrically conductive and for the arrangement at an inspection fixture and one exhibits straight, metallic case, in which a metallic, cylindrical screwing jerk feather/spring is arranged, which serves the axial suspension of a led of a contact element in the case, which stands out from the case in the direction of those test specimens which can be contacted in each case and exhibits contacting from test specimens serving a contact head, by the fact characterized that in the case (2) at least two straight screwing jerk feathers/springs (12, 13; 14-16) is coaxially to each other arranged, which serve the axial suspension of the contact element (7) together and are so arranged by those at least two screwing jerk feathers/springs of different turn diameters that the other one embraces.

2. Spring loaded contact pin according to requirement 1, by the fact characterized that all screwing jerk feathers/springs are so arranged that the forces exercised by them on the contact element (7) add themselves.

3. Spring loaded contact pin according to requirement 1 or 2, by the fact characterized that the screwing jerk feathers/springs form at least an outside screwing jerk feather/spring and an internal screwing jerk feather/spring, whereby the internal screwing jerk feather/spring (13; 14) into the interior that at least outside screwing jerk feather/spring (12; 15, 16) assigned are smaller, and the turn diameters of the internal screwing jerk feather/spring than the turn diameter of the outside screwing jerk feather/spring or fit with springs (12; 15, 16) are.

4. Spring loaded contact pin according to requirement 1 or 2, by the fact characterized that a only one internal screwing jerk feather/spring (13; 14) and preferably also a only one outside screwing jerk feather/spring (12) are intended.

5. Spring loaded contact pin after one of the preceding requirements, by the fact characterized that two outside and an internal screwing jerk feather/spring are intended, whereby preferably equal large turn diameter interlinks exhibiting outside screwing jerk feathers/springs (15, 16).

6. Spring loaded contact pin after one of the preceding requirements, by the fact

characterized that all screwing jerk feathers/springs (12, 13) exhibit same directiondirection direction.

7. Spring loaded contact pin after one of the requirements 1-5, by the fact characterized that at least one screwing jerk feather/spring (14) exhibits opposite directiondirection direction to that or the other screwing jerk feathers/springs (15, 16).

8. Spring loaded contact pin after one of the preceding requirements, thereby characterized that all screwing jerk feathers/springs (12, 13) are linked up, preferably same einbaulaengen exhibit.

9. Spring loaded contact pin after one of the preceding requirements, thereby characterized that the einbaulaenge of a screwing jerk feather/spring is larger (14) than the einbaulaenge of the other screwing jerk feather/spring and/or fits with springs (15 16).

10. Spring loaded contact pin after one of the preceding requirements, by the fact characterized that the einbaulaenge of the screwing jerk feather/spring with the smaller turn diameter is smaller than the einbaulaenge of the other screwing jerk feather/spring and/or fits with springs.

11. Spring loaded contact pin after one of the preceding requirements, by the fact characterized that all screwing jerk feathers/springs exhibit different einbaulaengen.

12. Spring loaded contact pin after one of the preceding requirements, by the fact characterized that at least one screwing jerk feather/spring (12 to 16) is a cylindrical coil spring.

13. Spring loaded contact pin after one of the preceding requirements, by the fact characterized that the Windungszahl/cm of the internal screwing jerk feather/spring is different to that the outside screwing jerk feather/spring.

14. Spring loaded contact pin after one of the preceding requirements, by the fact characterized that the contact element (7) is a contact pin, which exhibits contacting from test specimens serving a contact head (9) that firmly with in the case a (2) slidable stored, by the screwing jerk feathers/springs (12, 13; 14, 15, 16) loadable and/or loaded pistons (6) are connected, and that the contact pin is einstueckig preferably substantial and/or.